NON-PUBLIC?: N
ACCESSION #: 9511070250
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Susquehanna Steam Electric Station-Unit 1 PAGE: 1 OF 3

DOCKET NUMBER: 05000387

TITLE: Reactor Scram Following Turbine Trip On High Vibration
EVENT DATE: 07/12/93 LER #: 93-008-01 REPORT DATE: 11/02/95

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: TA COMPONENT: TRB MANUFACTURER: G084
REPORTABLE NPRDS: YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 1635 hours on July 12, 1993, with Unit 1 operating at 100% power, a reactor scram occurred, per design, when the Main Turbine tripped. All major equipment operated per design during the transient, Emergency Core Cooling Systems (ECCS) were not challenged and no abnormal operator actions were required to place the unit in a stable condition. The reactor scram was caused by a turbine control valve fast closure that resulted from a turbine master trip actuation. The turbine master trip was caused by Main Turbine high vibration as a result of failure of two turbine blades on the 'C' Low Pressure Turbine. The turbine blade failure was caused by electrical system torsional induced vibration. This event was determined to be reportable per 10CFR50.73(a)(2)(iv) in that an unplanned ESF actuation occurred when the RPS initiated an automatic reactor scram following turbine control valve fast closure with power greater than 24%. The plant was safely shut down and there were no safety consequences or compromise to public health or safety during this

incident, nor would there have been under different initial operating conditions. This transient was within the bounds of a turbine trip as analyzed in Chapter 15 of the FSAR. Repairs were made to the turbine and an inertia ring was installed, at the manufacturer's recommendation, to minimize the potential for high cycle fatigue as a result of excited torsional vibrations. Subsequent inspections, testing, torsional test reports for both (Unit 1 and Unit 2) Susquehanna units and analytical results all reinforced the initial 8/12/93 root cause conclusion and the corrective actions taken.

END OF ABSTRACT

DESCRIPTION OF EVENT

At 1635 hours on July 12, 1993, with Unit 1 operating at 100% power, a Reactor Protection System (RPS; EIIS Code: JC) actuation occurred when the Main Turbine (EIIS Code: TA) tripped. Per design, the turbine control valves closed and an automatic reactor scram occurred. Both Reactor Recirculation (EIIS Code: AD) pumps tripped per design via the EOC-RPT logic circuitry. All control rods inserted fully. Two Safety Relief Valves (EIIS Code: SB) automatically lifted momentarily to control reactor pressure and properly reseated. The immediate operator actions for reactor scram and reactor pressure control were performed. Reactor water level reached 0 inches before recovering. Two of three Feedwater Heater (EIIS Code: SN) strings isolated. All major equipment operated per design during the transient, Emergency Core Cooling Systems (ECCS) were not challenged, and no abnormal operator actions were required to place the unit in a stable condition.

CAUSE OF EVENT

The reactor scram was caused by a turbine control valve fast closure which resulted from a turbine master trip actuation. The turbine master trip was caused by Main Turbine high vibration as a result of failure of two turbine blades on the 'C' Low Pressure Turbine. The turbine blade failure was caused by electrical system torsional induced vibration.

REPORTABILITY/ANALYSIS

This event was determined reportable per 10CFR50.73(a)(2)(iv), in that an unplanned Engineered Safety Feature (ESF) actuation occurred when the RPS initiated an automatic reactor scram following turbine control valve fast closure with power greater than 24%. All major equipment operated per design during the transient, ECCS was not challenged and no abnormal

operator actions were required to place the unit in a stable condition. The plant was safely shut down and there were no safety consequences or compromise to public health or safety during this incident, nor would there have been under different initial operating conditions.
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transient was within the bounds of a turbine trip as analyzed in Chapter 15 of the FSAR.

In accordance with the guidance provided in NUREG 1022 Supplement 1 item 14.1, the required submission date for this report was determined to be August 11, 1993.

CORRECTIVE ACTION

Repairs made to the 'C' Low Pressure Turbine included replacement of the L-1 and L-0 turbine blades on both ends of the turbine, repair of damaged turbine diaphragms and repair of low pressure condenser damage. Visual inspections were completed on the 'B' Low Pressure Turbine and no damage was found.

A modification was performed to install an inertia ring, at the manufacturer's recommendation, to minimize the potential for high cycle fatigue as a result of excited torsional vibrations.

Subsequent inspections, testing, torsional test reports for both (Unit 1 and Unit 2) Susquehanna units and analytical results all reinforced the initial 8/12/93 root cause conclusion and the corrective actions taken.

ADDITIONAL INFORMATION

Failed Component Identification:

Component: Turbine
Manufacturer: General Electric

Previous Similar Events: None

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November 2, 1995

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 93-008-01
PLAS - 651 FILE R41-2

Docket No. 50-387
License No. NPF-14

Attached is Licensee Event Report 93-008-01. This report is provided as a supplement to Licensee Event Report 93-008-00 which was determined reportable per 10CFR50.73(a)(2)(iv), in that an unplanned Engineered Safety Feature actuation occurred when the Reactor Protection System initiated an automatic reactor scram following turbine control valve fast closure with power greater than 24%. The final root cause evaluation for the turbine blading failure which resulted in the unplanned automatic reactor scram concluded that the blade failure was caused by electrical system torsional induced vibration.

H. G. Stanley
VP - Nuclear Operations

RRW/dmd

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